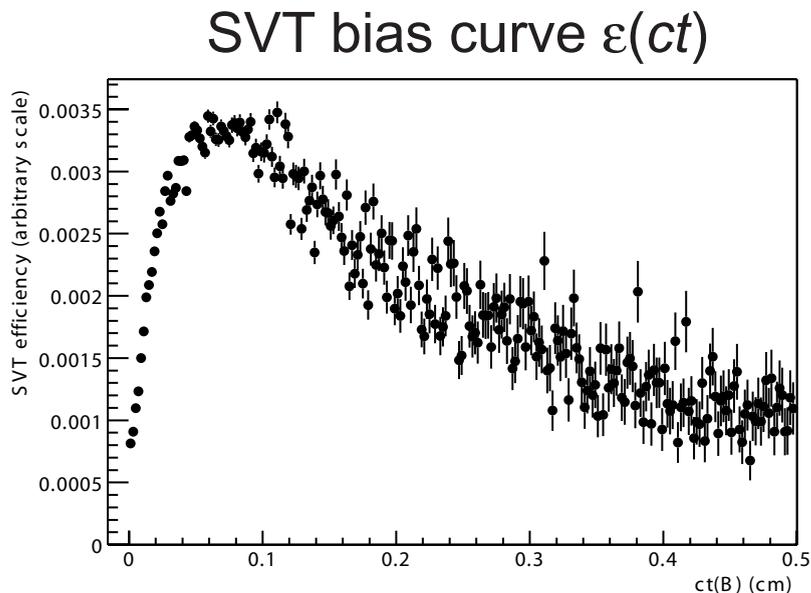


# SVT bias curve from the generator-level and realistic monte carlo

*Jan-21 lepton+SVT meeting  
Satoru Uozumi*



We calculate the  $\varepsilon(ct)$  from the MC,  
but how we can make it convincing?

The shape of the  $\varepsilon(ct)$  is depending on ...

- Kinematics of the B and its daughters
- Impact parameter cut (for both SVT & SVX)
  - $d_0$  resolution
  - Correlation of the  $d_0(\text{SVT}) - d_0(\text{SVX})$
  - Other SVT properties  
(e.g. tracking efficiency dependence on  $P_T$ ,  $d_0$  ...)

We can compare all of them which affect  
to the  $\varepsilon(ct)$  between the real data and the MC.

# Two monte carlos

## 1. Generator-level MC

- BGenerator+QQ , toy resolution smearing
- o Easy to tune the resolution functions
- o Easy to generate large number of events
- x Difficult to simulate "hidden" correlations (if any)

## 2. Realistic MC (by Alex)

- o It simulates all. (detector, trigger, SVT,.....)
- o We can do direct comparison with the data
- o Good agreement with the data
- x Hard to get large amount of data
- x Difficult to tune the resolution function

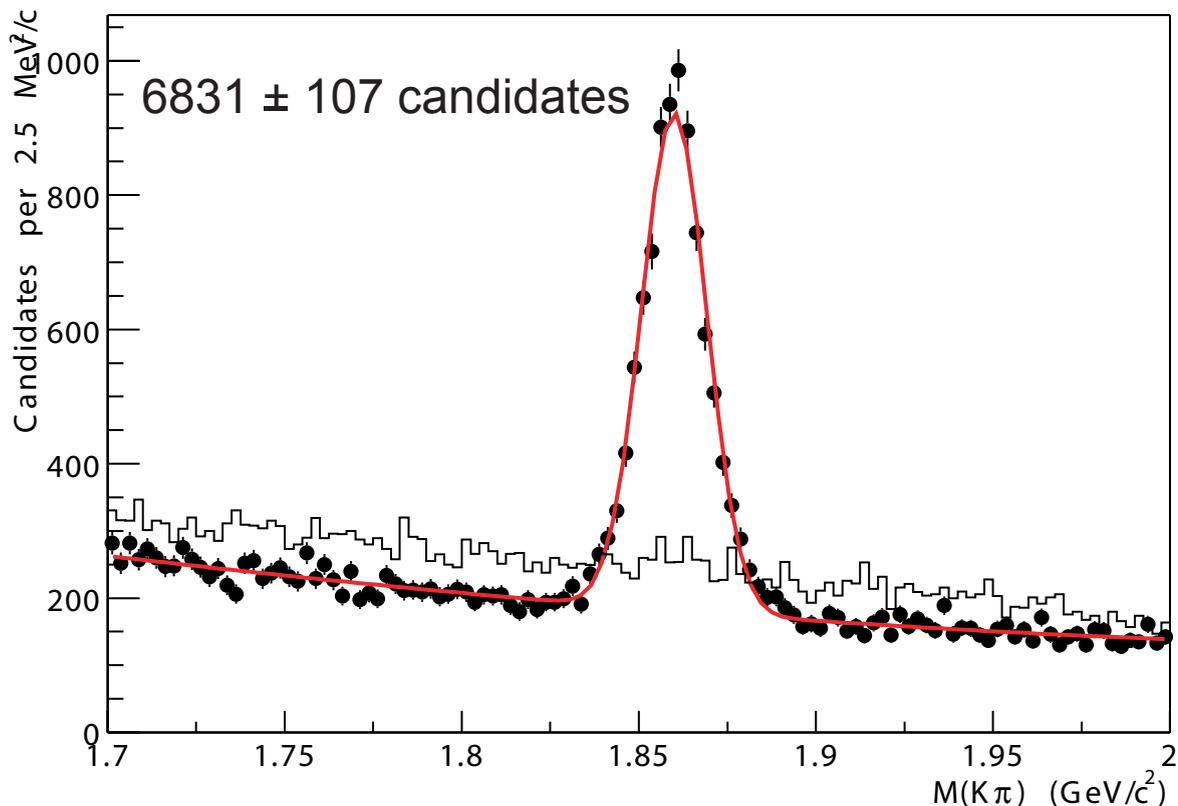
Generator-level MC would be useful to obtain the  $\varepsilon(ct)$ .

Realistic MC is also necessary for check.

Now compare these MCs with the real data ...

Data :  $\mu+D^0$  from jbot2h,  $\sim 60\text{pb}^{-1}$

- SVT-SVX matching and do cut by LeptonSvtSel
- # of SVX r- $\phi$  hits  $\geq 3$  (for all  $\mu, K, \pi$  tracks)
- # of COT Ax&St wire hits  $\geq 20$   
(for all  $\mu, K, \pi$  tracks)
- $P_T(K, \pi) > 0.5 \text{ GeV}/c$
- $dr(\mu-K, \pi) < 1.58$
- $|\Delta z(\mu-K, \pi)| < 2 \text{ cm}$
- $M(\mu+D^0) < 5 \text{ GeV}/c^2$
- offline SVT reconfirmation for K or  $\pi$  track
- $L_{xy}(\text{PV}-D^0) > 400 \mu\text{m}$
- $-150 < ct(D^0) < 600 \mu\text{m}$



# MC configuration

Realistic MC :  $B^0/B^+ \rightarrow l \nu D^0 X$ ,  $D^0 \rightarrow K \pi$

- generated under the configuration of run 142210
- generated 7M events each  $B^0$ ,  $B^+$  by Bgenerator
- Apply same cuts with the real data
- 21K events passed (8300  $B^0$ , 12800  $B^+$ )

## Generator-level MC

- $d_0$  resolution smearing for both SVX, SVT by gaussian with  $\sigma = 50 \mu\text{m}$
- SVT-SVX  $d_0$  correlation factor = 0.75
- No smearing for other parameters

### - Cuts

$$P_T(\mu) > 4 \text{ GeV}/c$$

$$dr(\mu-K, \pi) < 1.58$$

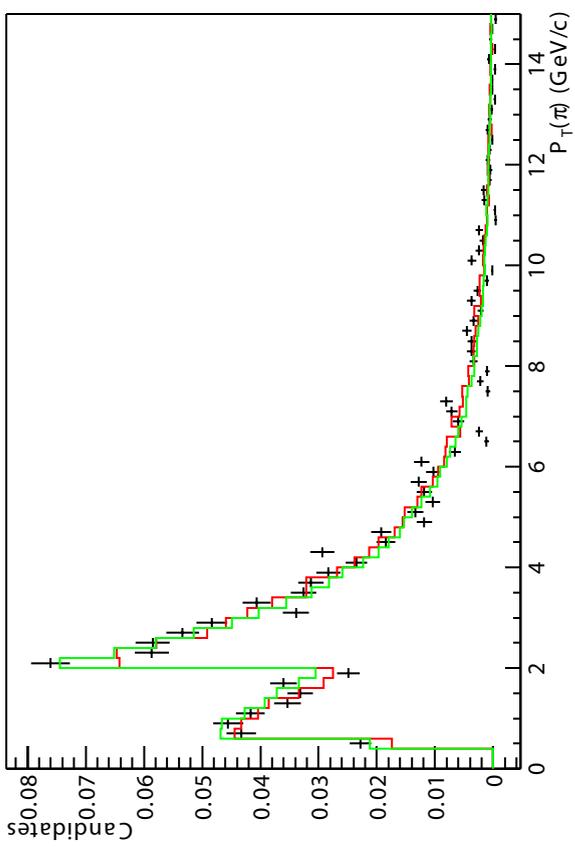
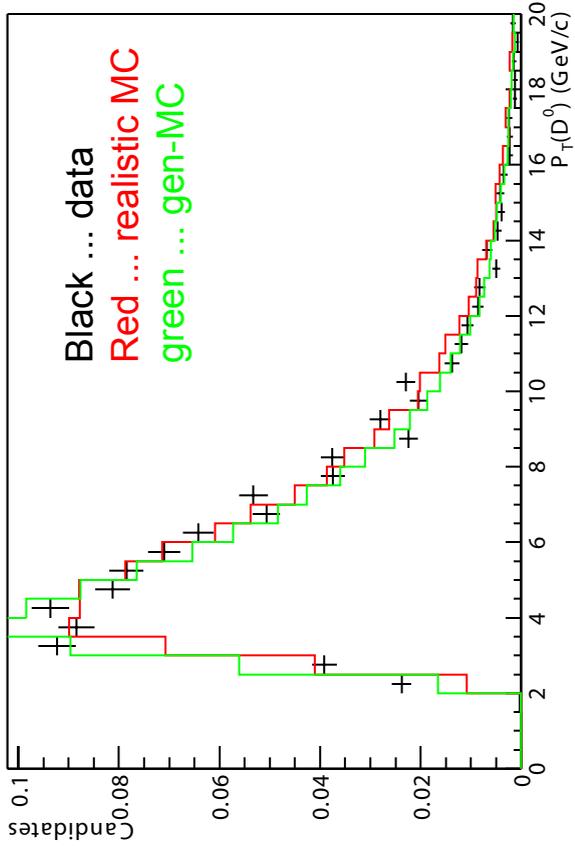
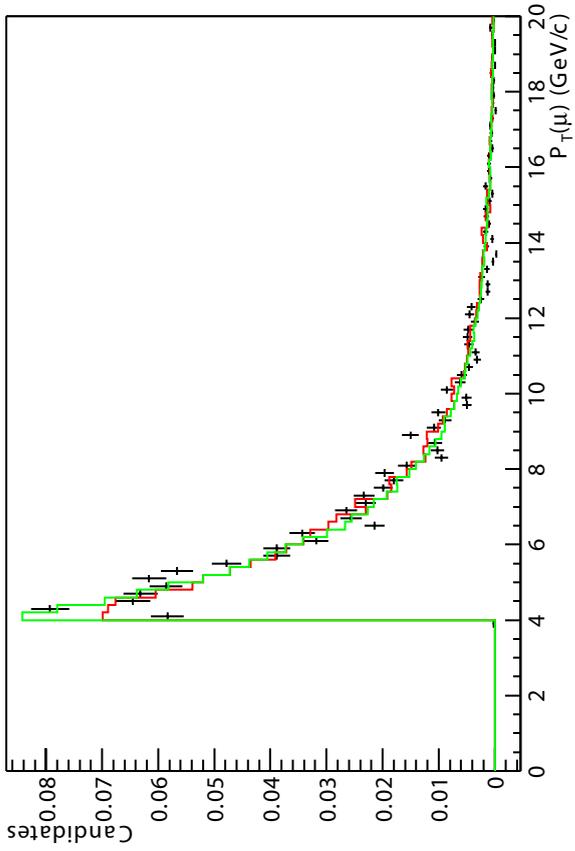
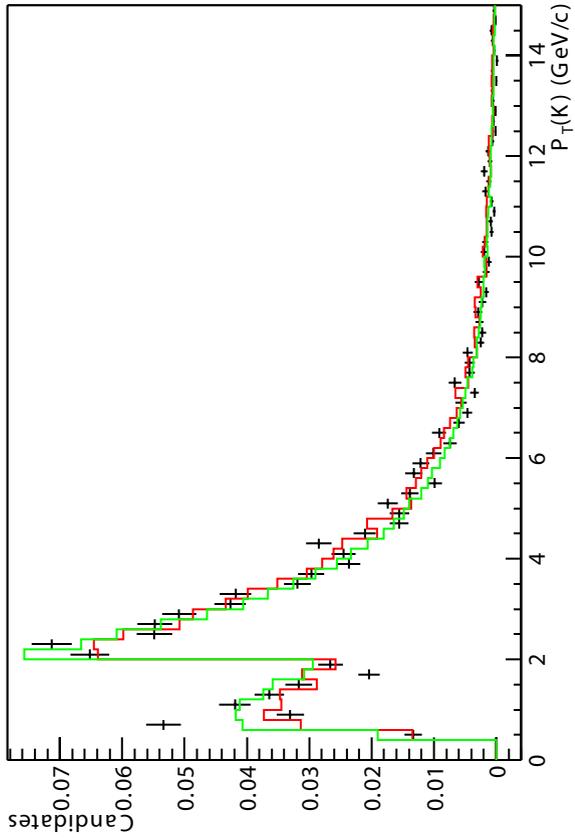
$$P_T(K, \pi) > 0.5 \text{ GeV}/c$$

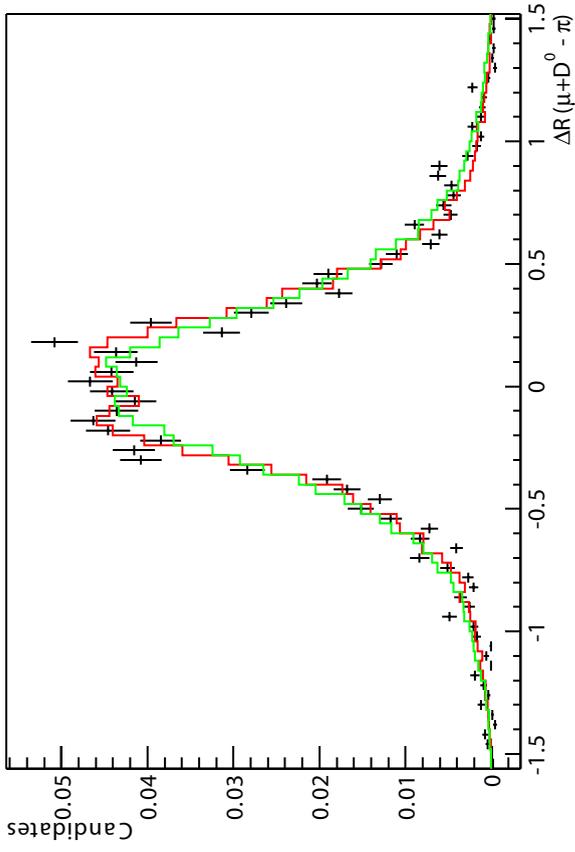
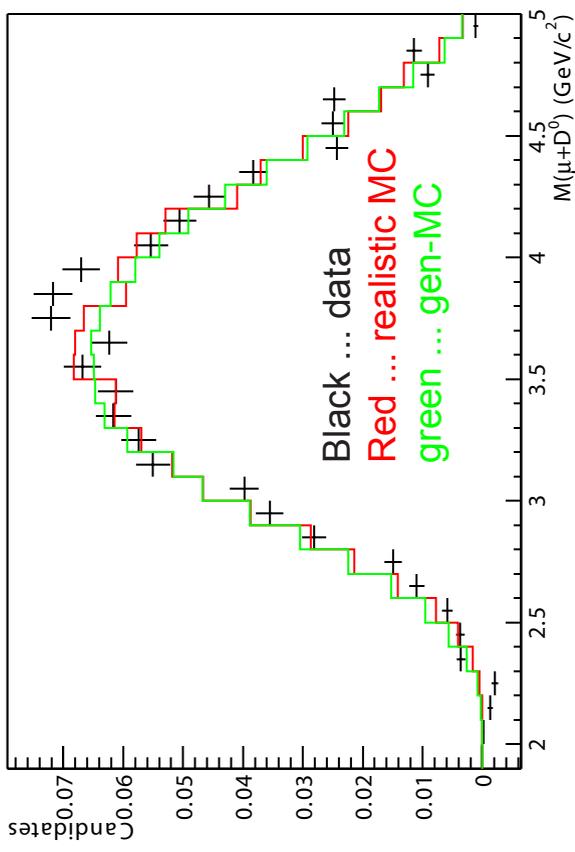
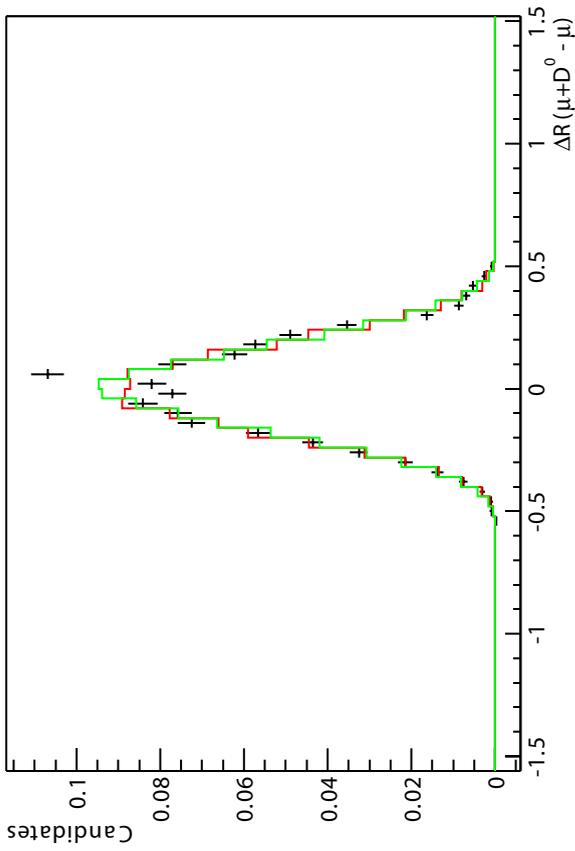
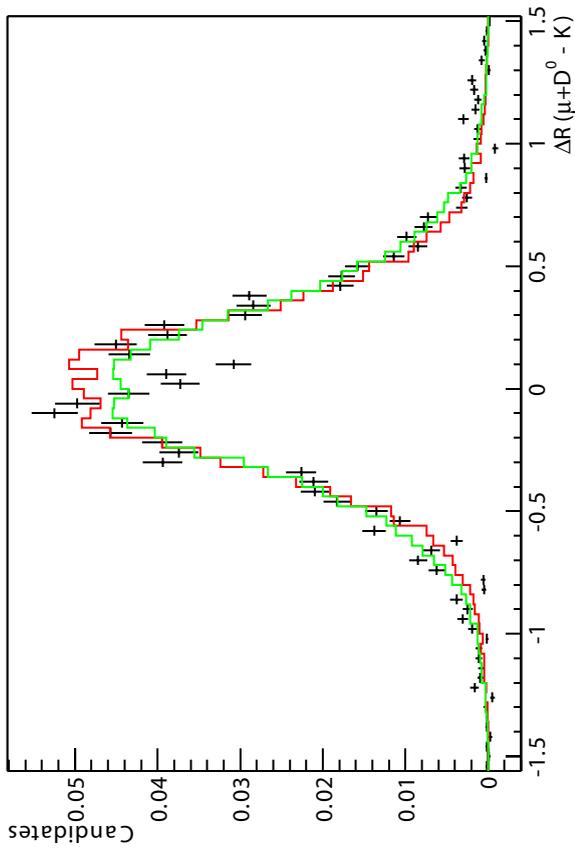
$$|\eta(\mu, K, \pi)| < 1.1$$

one of the K or  $\pi$  track must satisfy

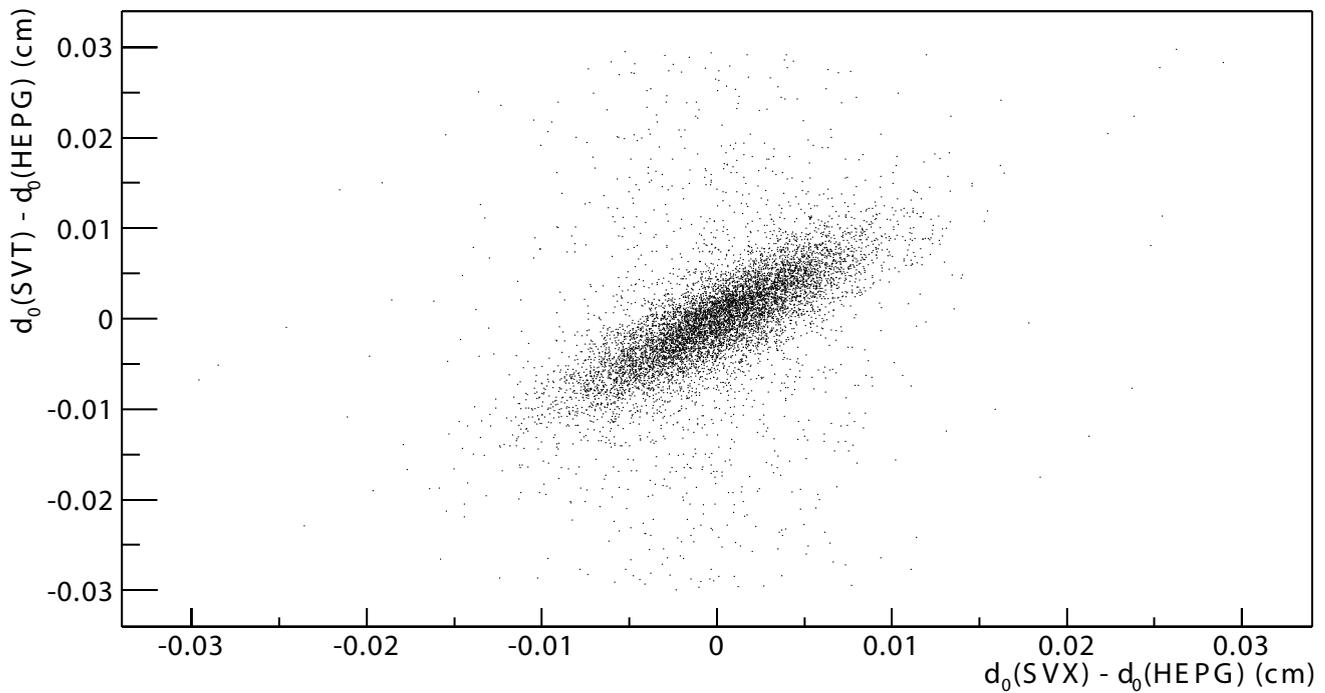
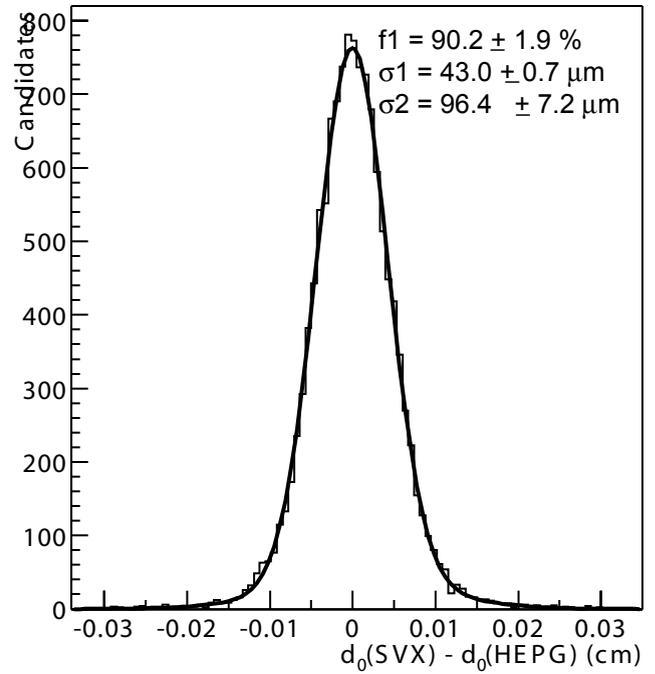
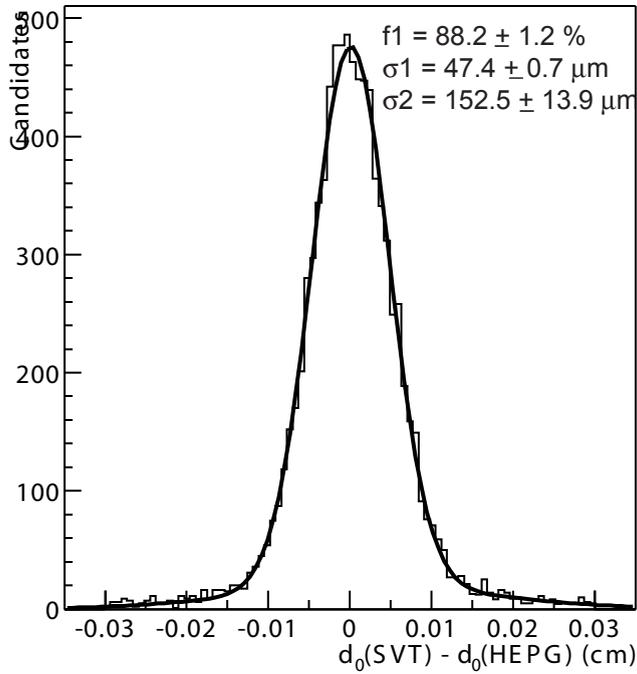
the SVT requirement

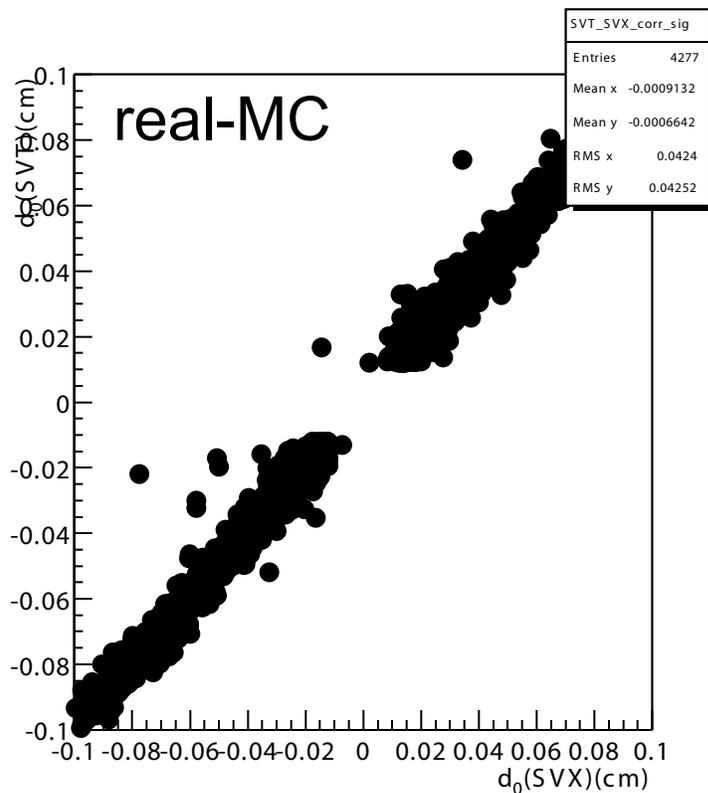
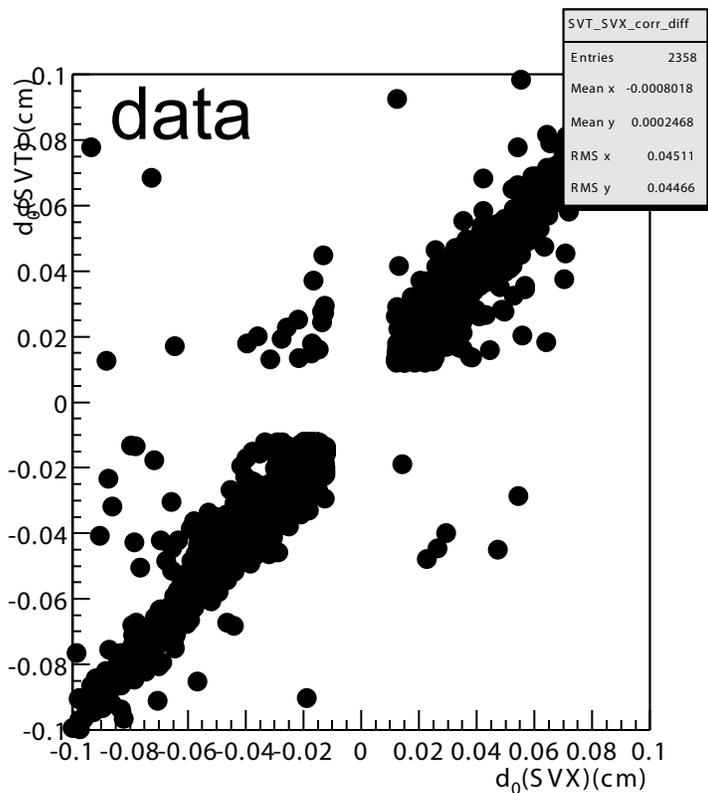
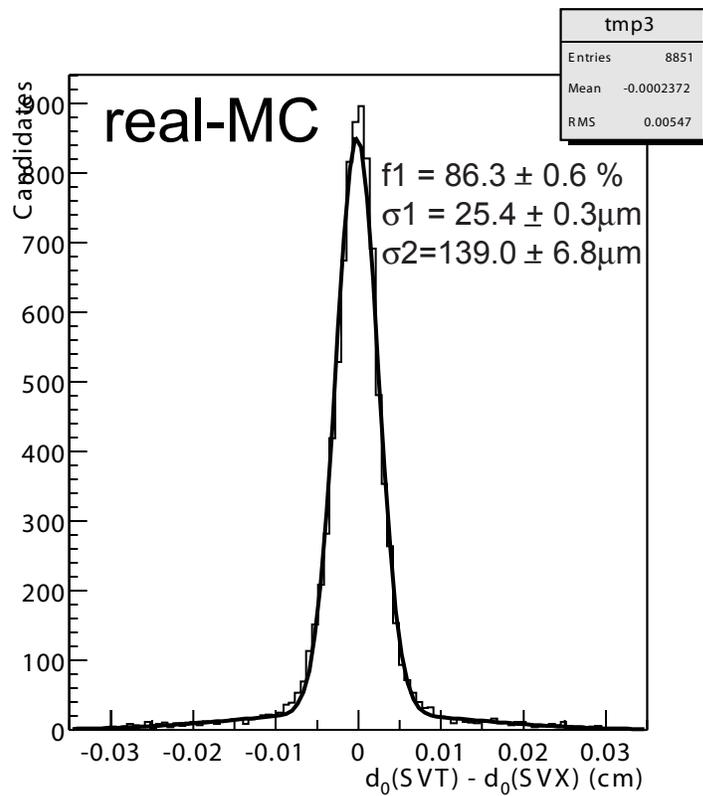
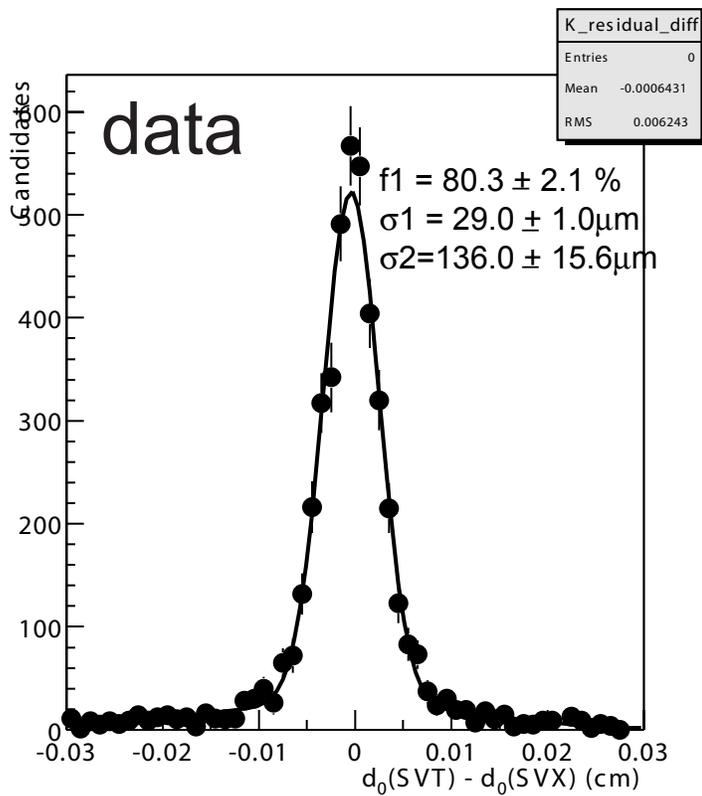
$$(120 < |d_0(\text{SVT}, \text{SVX})| < 1000 \mu\text{m}, P_T > 2\text{GeV}/c)$$

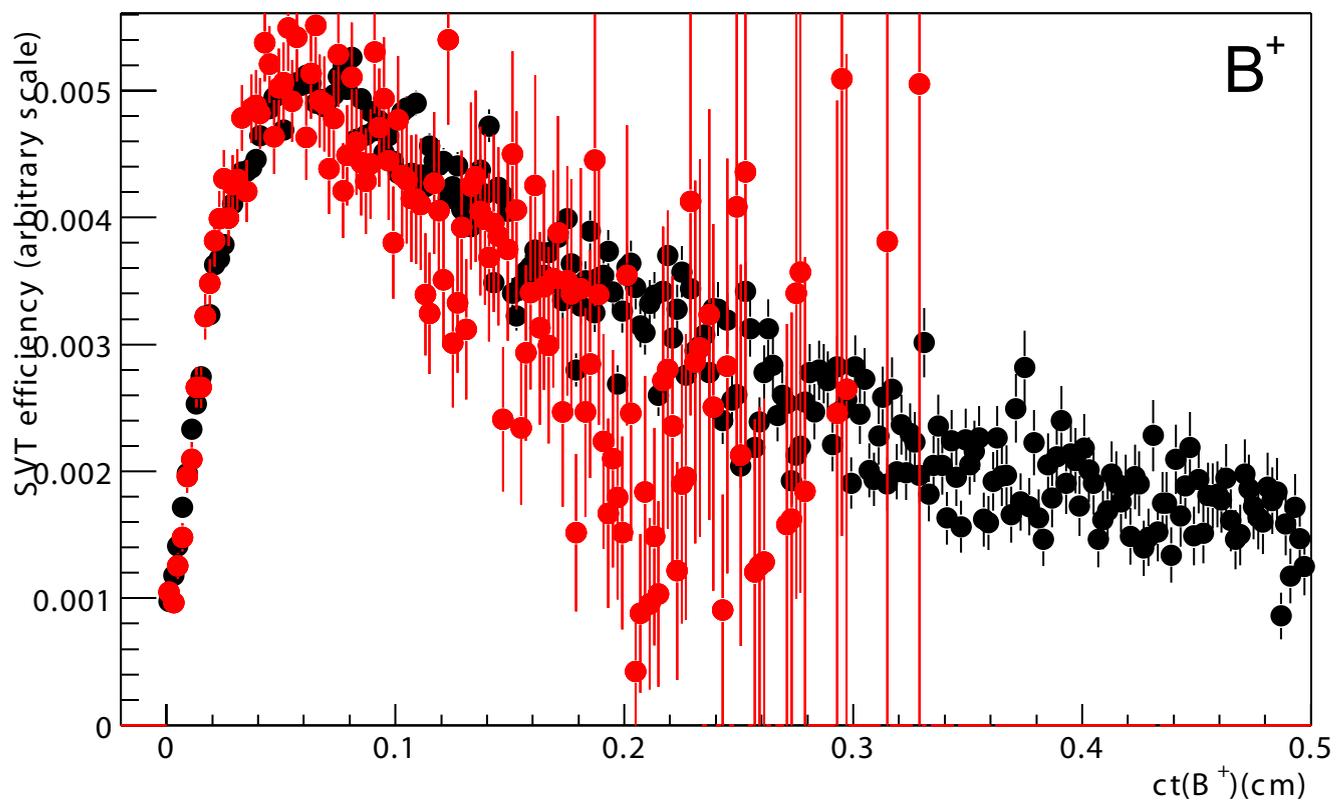
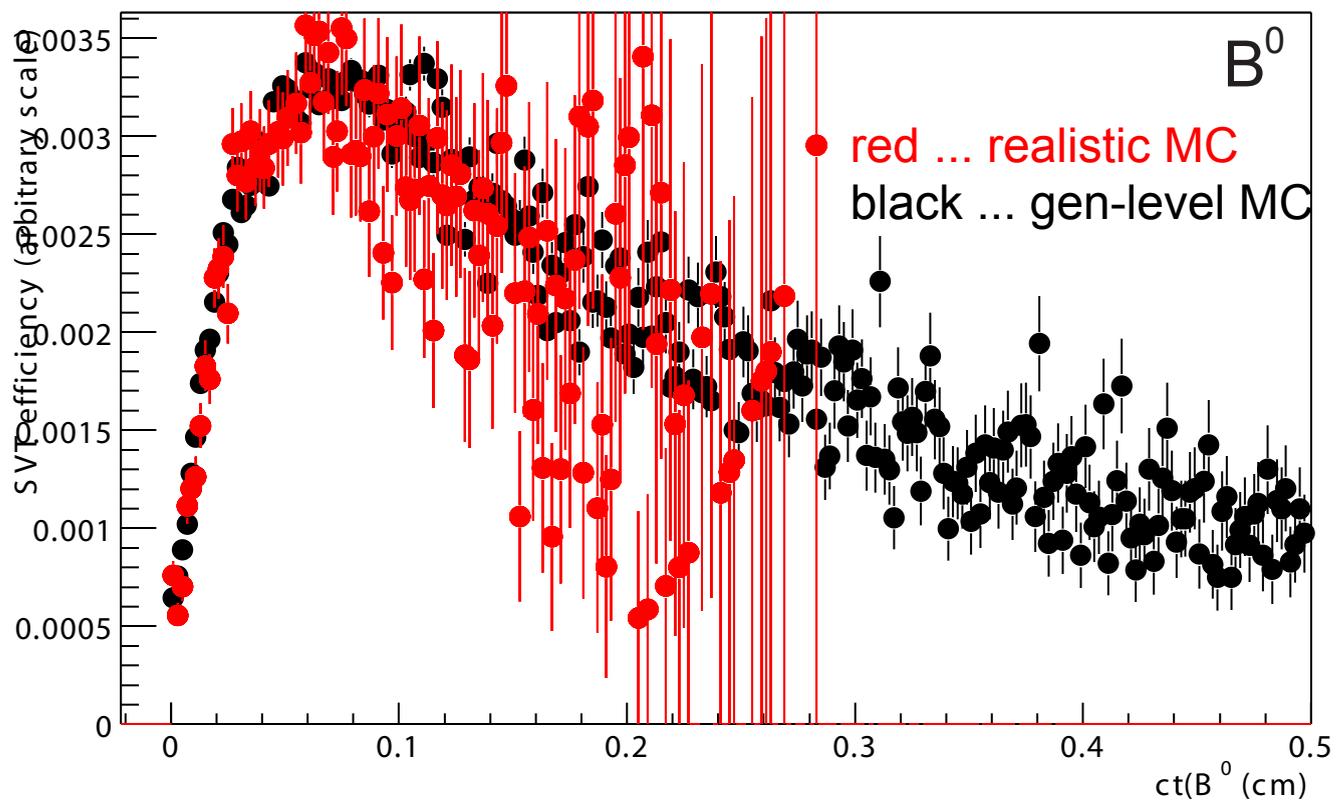




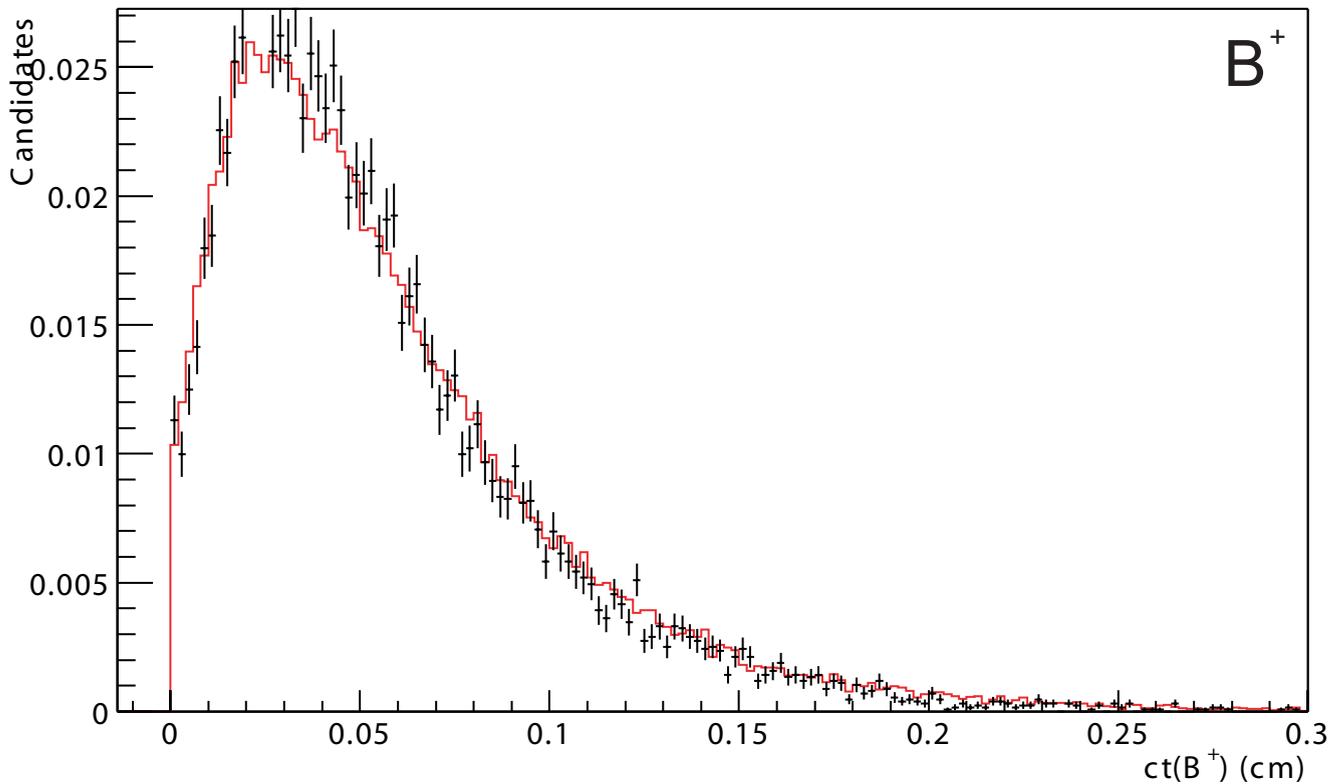
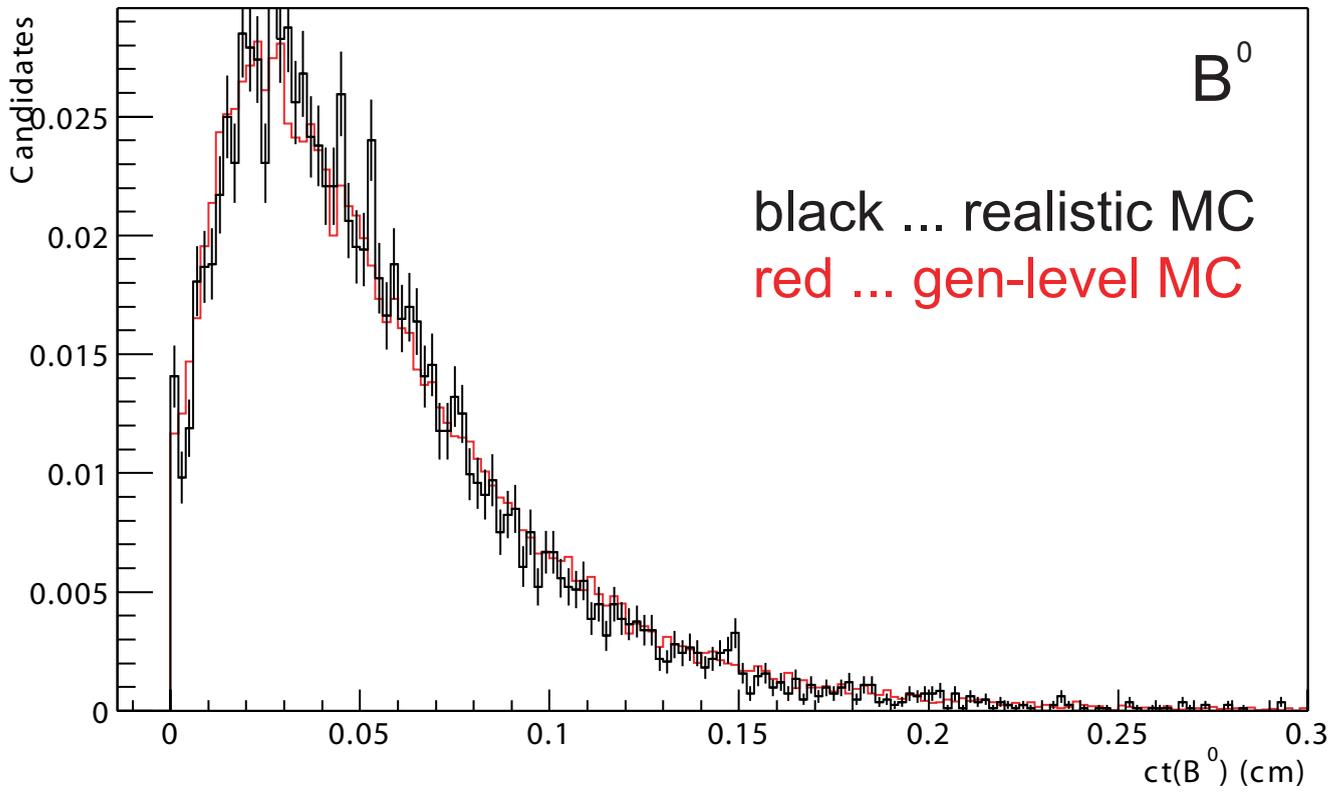
# d0 resolution : realistic MC







# ct(B) distribution after the cut



# Conclusion

Generator-level MC looks OK to get the SVT bias curve, but some more tuning is necessary for complete agreement with the realistic MC.

Realistic MC agrees with the real data very well. It is very useful for the check. It also gives us a nice exercise of the lifetime fit before we try to fit the real data.

# Plans

- Tuning the cut and resolution function of the generator-level MC (Lxy cut etc ...)
- Increase statistics of the realistic MC sample
- Look into minimum bias data to study  $\sigma(d_0)$  of the SVT and SVX
- Understand decay length resolution from backup sample
- Check with non-biased sample (e.g. 8GeV lepton)